

(No Model.)

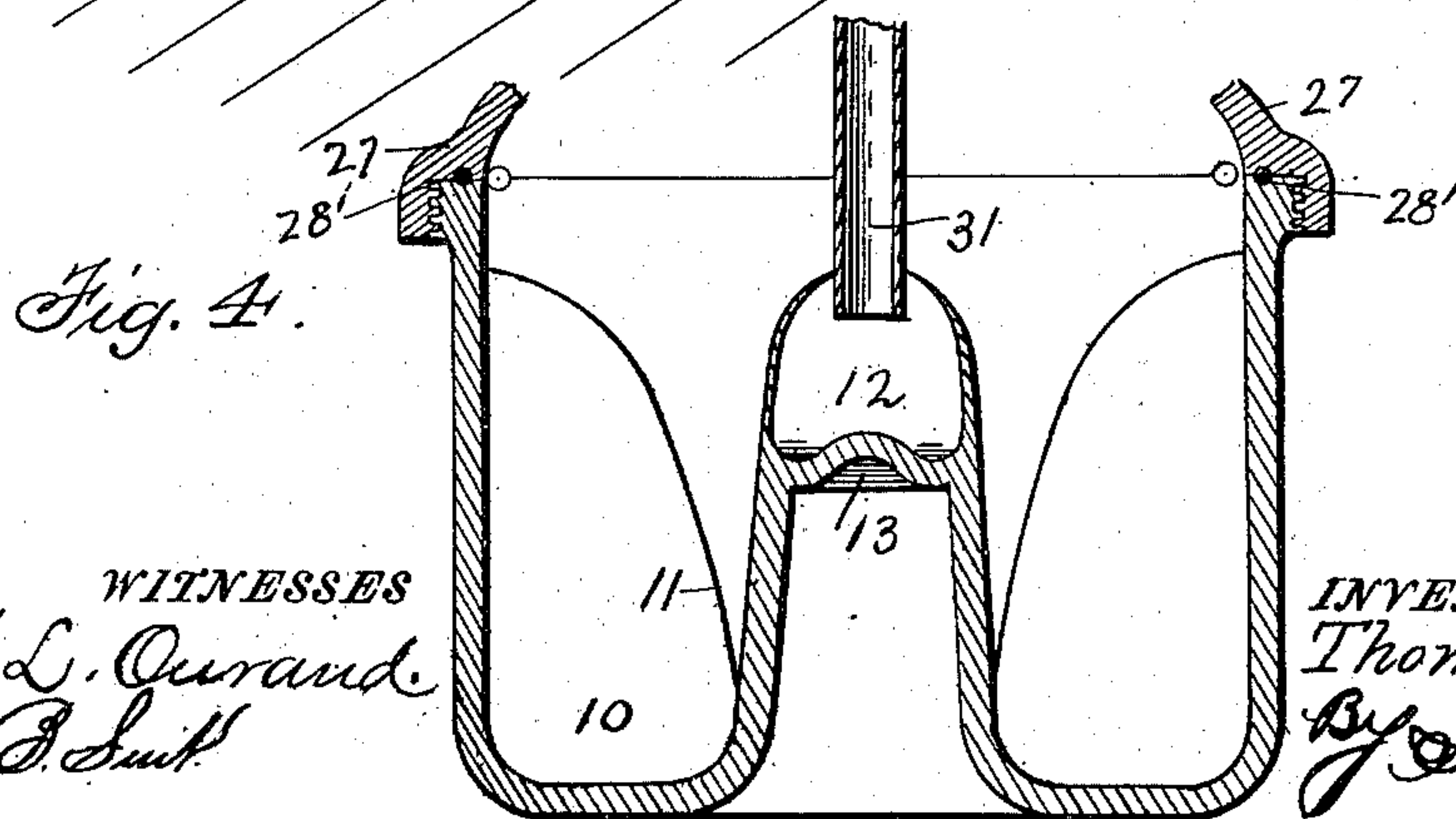
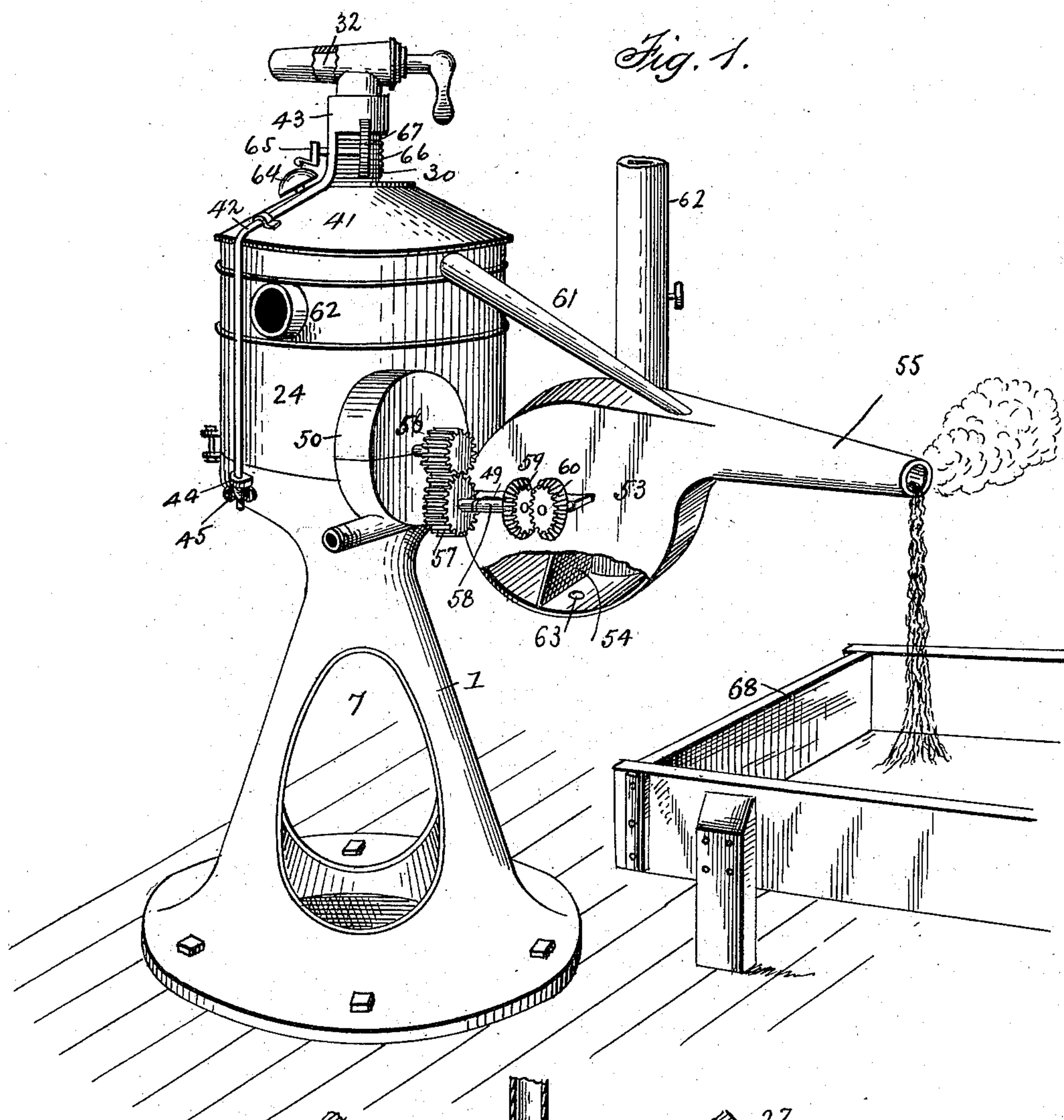
3 Sheets—Sheet 1.

T. WILLING.

CENTRIFUGAL CREAM SEPARATOR AND PURIFIER.

No. 565,654.

Patented Aug. 11, 1896.



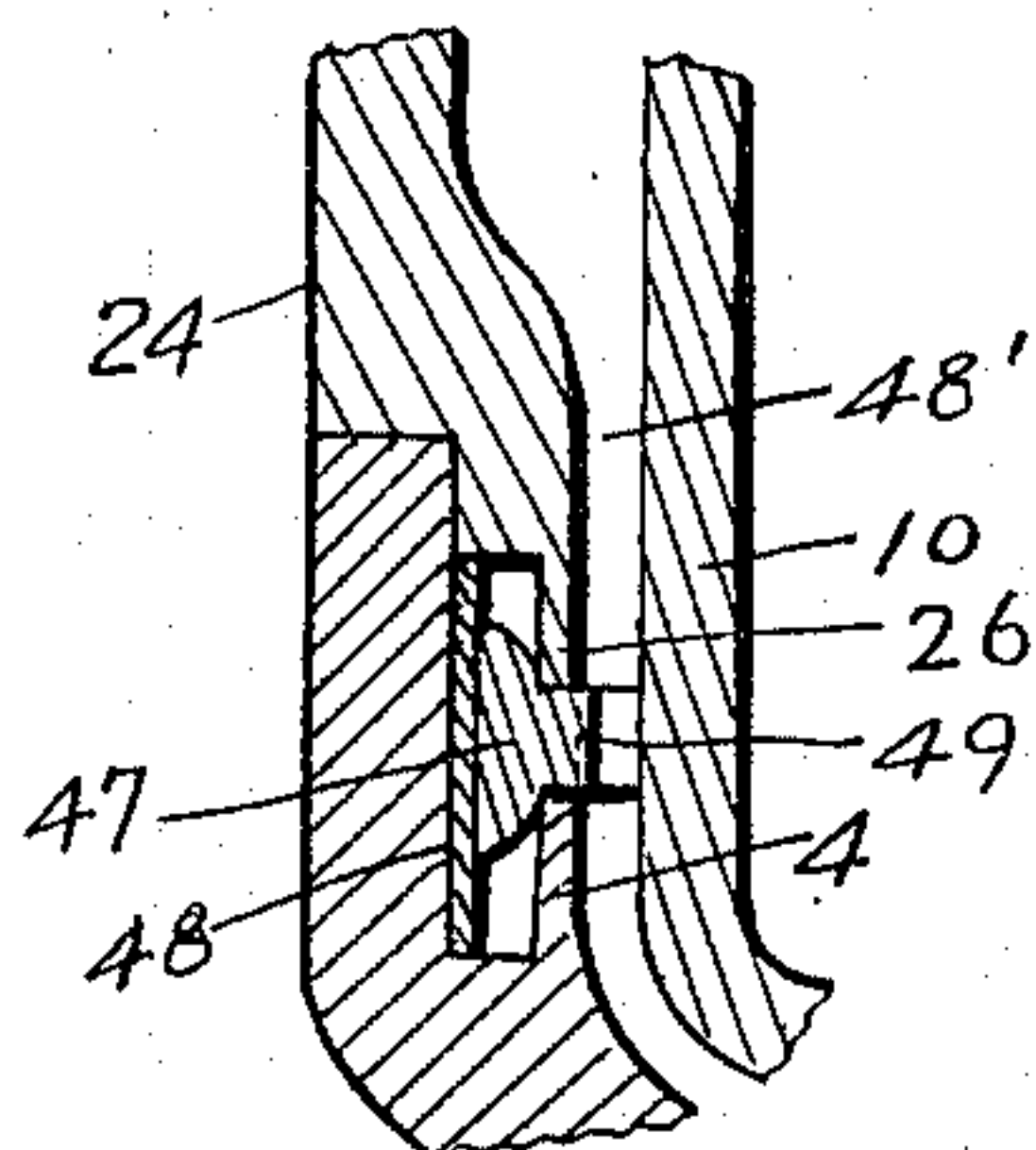
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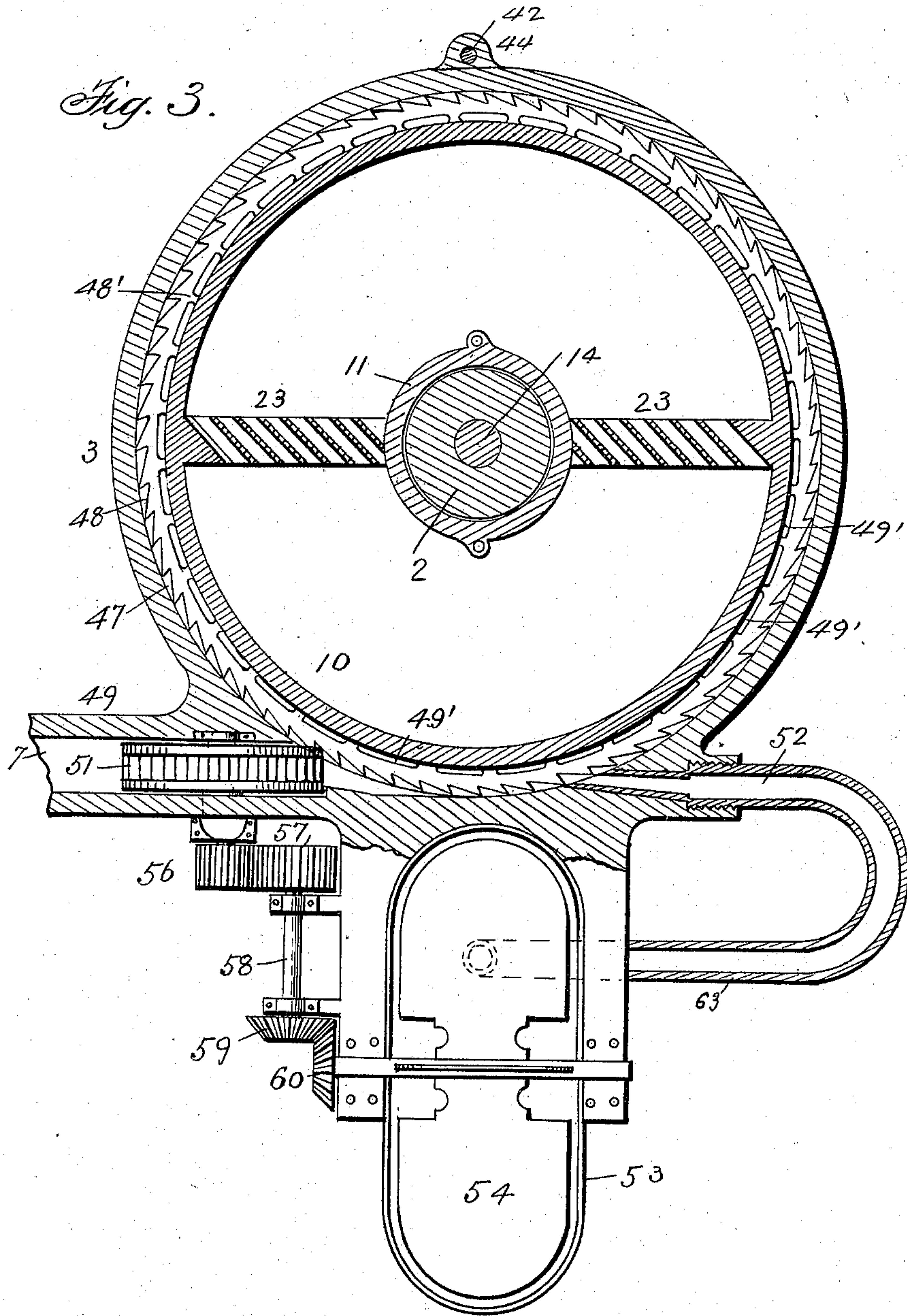


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(No Model.)

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UNITED STATES PATENT OFFICE.

THOMAS WILLING, OF ASTORIA, OREGON.

CENTRIFUGAL CREAM SEPARATOR AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 565,654, dated August 11, 1896.

Application filed November 4, 1895. Serial No. 567,960. (No model.)

To all whom it may concern:

Be it known that I, THOMAS WILLING, a citizen of the United States, residing at Astoria, in the county of Clatsop and State of Oregon, have invented certain new and useful Improvements in Centrifugal Cream Separators and Purifiers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to centrifugal cream separators and purifiers.

The object of my invention is to provide a cream-separator which is simple and stable in construction and which is effective and expeditious in separating the cream from the milk, and to provide means associated therewith for cooling and aerating the cream, and, finally, to provide improved means for purifying the cream by the agency of a steam-blast.

With these objects in view the invention consists of certain features of construction and combination of parts, which will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a perspective view of my improved separator and purifier. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a transverse sectional view on line *x x*, Fig. 2. Fig. 4 is a detail sectional view of the bowl. Fig. 5 is an enlarged sectional view of a portion of the casing and the supporting-base, showing more clearly the vane-ring and the annular steam-channel in which it revolves.

In the drawings, 1 denotes the supporting-base, which is preferably hollow, as shown, and which is provided centrally at its upper end with a conical extension 2 and at its sides with an outwardly and upwardly extending flange 3, provided interiorly with an upwardly-extending shoulder 4, which forms an annular seat or recess 5. The top of the base is provided with vent-apertures 6 and the sides of the base have an opening 7. The conical extension has a central bore 8, and from about the middle portion of which to the top it flares. The lower portion of the bore is screw-threaded, as shown at 9.

A bowl 10 has a conical upwardly-extending bottom 11, which is seated upon the con-

ical extension. The upper end of this conical bottom is formed with a cup 12, which has an arched bottom 13. A plug 14 is screwed into the lower screw-threaded end of the conical extension of the base. A screw 15 is employed for adjusting the plug vertically, the nut 16 serving to bind the parts and lock them against rotation.

17 denotes a block supported upon the upper end of the plug and provided with a semi-circular seat in which is supported a ball 18.

19 denotes a bushing which is tapered to correspond with the upper portion of the bore of the conical extension, and is provided with grooves in its sides to supply oil to the bearing.

20 denotes a pin which extends through the bore and has its lower end formed with a circular head 21 and its upper end formed with a semicircular head 22, which is adapted to fit into the semicircular seat in the bottom of the cup 12.

23 designates a series of slats disposed at determined distances apart and secured in the bowl. These slats are of any desired number required to accomplish the object, and are arranged diametrically across the bowl, substantially as shown in Fig. 3 of the drawings, with their faces at an angle or incline to the radii on which arranged, and having their lower ends rigidly fixed to the bottom of the bowl and their upper ends fixed in or to bars or plates 23^x, as shown. The outer slat of each set or series of slats has its outer vertical edge arranged and secured contiguous to the inner face of the bowl. The slats are of gradually-decreasing height from the outer to the inner, so that the plates 23^x have the contour of a parabolic curve, the lower and inner extension of the plates extending down, as shown, and the end thereof being secured to the bottom of the bowl. These slats serve the purpose of agitating and throwing the milk toward the center while in its upward course in the act of skimming, without frothing or cutting the cream, and form a very important part of my invention.

24 denotes an outer shell or casing, which is seated upon the upper edge of the flange 3, and has an annular flange 25, projecting within the flange 3, and provided with an annular lip 26, which, in conjunction with the shoul-

der 4, forms the channel within which revolves the vane-ring hereinafter described.

27 denotes a conical top or cover for the bowl, which has a screw-threaded connection with the upper end of the bowl, as shown at 28, and has its upper end terminating in a neck 29, formed with a worm 30. A rubber packing-ring 28' is placed upon the upper end of the bowl and serves to prevent any leakage at that point. A supply-pipe 31 extends through the neck with its lower end projecting into the cup 12, a valve-plug 32 being arranged within the upper end of said pipe for the purpose of regulating the supply of milk to the cup.

33 denotes a pipe which leads from the bottom of the cup to the lower end of the bowl, and is adapted to discharge the milk from the cup into the lower end of the bowl.

34 denotes a pan which is seated upon the cover of the bowl, and which is provided on its lower annular end with a shoulder to fit the upper end of the casing. Pipes 35 are secured to the inside of the cover and have their outer ends projecting laterally. These pipes are formed with nozzles 36, adjacent to their ends, which project through the cover of the bowl and communicate with the pan. A screw-plug 37 is located in the upper ends of the pipes and adapted to regulate the flow of the skimmed milk through said pipes into the pan, from whence it may be led into any suitable vessel through a pipe or trough 38. Seated upon this pan is a cream-pan 39, which communicates with the upper contracted end of the bowl-cover through short pipes 40, and is provided with a cover 41.

42 denotes a rod provided at its upper end with a collar 43, which fits over the neck of the bowl-cover. This rod extends down over the cover of the cream-pan, down over the sides of the outer casing, and projects through a lug 44, and is provided with a thumb-screw 45. By adjusting this screw the pans are held firmly in position, and to prevent injury to the pans by an undue strain upon the rod 42 I have provided the rod with rubber collars 46, which are forced tightly against the cover of the cream-pan when the thumb-nut is tightened.

47 denotes a ring the inner web-shaped periphery of which is fixedly secured to the bowl near its lower end, and the outer edge of which is provided with vanes 48, which extend into the channel hereinbefore mentioned as being formed by the shoulders 26 and 4, which engage the upper and lower sides of the web portion of the ring to prevent the steam escaping from the chamber into the air-space 48', formed under and around the bowl. This air-space is in communication with the outer air through the hole 7 in the sides of the base and the vent-apertures 6 in the top thereof, and the vane-ring has its web formed with openings 49' to allow the air to pass up therethrough above the ring, whereby

a natural and uniform temperature is imparted to the milk, which would otherwise be heated by the use of the steam employed to rotate the parts.

Secured to or cast on one side of the flange 3 of the base are supporting-arms 49. A wheel-casing 50 is also secured at the sides of the base and communicates with the interior of the casing and is provided with a bucket-wheel 51.

52 denotes a steam-pipe, which enters the casing and through which the steam passes and strikes the vanes on the ring, thus setting the ring and the bowl to which it is secured in motion. The steam exhausts against the wheel 51, which will rotate said wheel for a purpose hereinafter to appear.

Secured between the supporting-arms is a fan-casing 53, having journaled therein a fan 54 and provided with a discharge-blast nozzle 55. Secured to the shaft of the bucket-wheel 51 is a pinion 56, which meshes with a gear 57, fixed to the end of a shaft 58, journaled in bearings secured to the side of one of the supporting-arms. The other end of the shaft has a beveled pinion 59, which is in mesh with a pinion 60, secured to the fan-shaft. It will thus be seen that the bowl is revolved by the steam striking the vanes secured thereto, and the exhaust-steam acting upon the wheel will cause the fan to be rotated.

61 denotes a pipe leading from the cream-pan to the nozzle of the fan-casing.

62 denotes a cold-air-supply pipe leading from any suitable source of cold-air supply, such, for instance, as a refrigerator, to the fan-casing, so that as the cream is driven through the nozzle of the fan-casing it will be cooled and aerated. Should it be desired, however, to purify the cream by killing any disease-germs which may be contained therein, I subject the cream to a blast of steam, which is led into the bottom of the fan-casing by a steam-pipe 63, which is connected with the main steam-pipe that supplies steam to rotate the bowl.

In order that the number of revolutions made by the bowl may be announced or indicated, I provide an alarm. This consists of a suitable bell 64, tapped by a hammer 65, loosely secured to the end of a shaft 66, suitably journaled on the tightening-rod. On the inner end of this shaft 66 is mounted a gear-wheel 67, having a determined number, as one hundred, of spirally-arranged teeth meshing with the worm 30 on the upper end of the bowl-cover, so that for every one hundred revolutions of the bowl the wheel 67 will revolve once and the bell be struck by the hammer.

68 denotes a tank or receptacle in which the separated cream is discharged from the blast-nozzle.

As the theory and manner of separating cream from milk by centrifugal force is well-known in the art, it is not thought to be neces-

sary to enter into a detailed description thereof, and I will, therefore, simply describe the operation of the machine by which the result is attained. The milk is led into
 5 the cup 12 through the supply-pipe and then descends to the bottom of the bowl, which has been set into rotation by the steam striking the vanes upon the ring secured to the periphery of the bowl. As the milk discharges
 10 into the bowl it of course begins to rise, and the rapid rotation of the slats in the bowl will throw the milk to the center of the bowl inward and separate it from the cream, the skimmed milk passing out through its pipe
 15 into the pan secured on the bowl-cover, while the cream will flow out of the short pipes into its pan and be led to the nozzle of the fan-casing and mingle with the cold air forced through the nozzle, thus very effectively cool-
 20 ing and aerating the cream; or if it be desired, instead of using the cold air, the cream may be subjected to a steam-blast, which will effectively kill all disease-germs which may be contained in the cream.

25 Having thus described by invention, what I claim, and desire to secure by Letters Patent, is—

1. In a centrifugal separator, an outer casing formed with an annular channel in its interior adjacent to the base thereof, a rotatable bowl within the casing formed or provided with an annular vane-ring adapted to engage in the annular channel of the casing, and a steam-pipe opening into the said channel, whereby steam may be admitted against
 30 the vanes, and the bowl rotated.

2. In a centrifugal separator, an outer casing, a rotatable bowl within the casing, and a series of vertical slats arranged diametrically across the bowl, of gradually-decreasing
 40 heights from the outer one toward the middle

of the bowl and having their faces inclined to the radial line, in which located.

3. In a centrifugal separator, a supporting-base, formed with an interior annular channel, a rotatable bowl mounted thereon with
 45 a space between said base and the bottom and sides of the bowl, a vane-ring secured to the bowl having its vanes projecting into the channel of the base, and provided with vertical openings 49' in the web thereof, and a
 50 steam-pipe arranged to direct the steam against the vanes to rotate the bowl.

4. In a centrifugal separator, the combination with a suitably-mounted bowl, a fan and
 55 casing, and a pipe for conveying the separated cream from the bowl to the casing, vanes secured to the periphery of the bowl, a bucket-wheel, gearing connecting the bucket-wheel with the fan in the casing, a steam-
 60 pipe to direct the steam against said vanes for rotating the bowl and the bucket-wheel, whereby the fan is rotated, substantially as set forth.

5. In a centrifugal separator, a suitable casing formed with an interior annular channel, a revoluble bowl within the casing, having a
 65 vane-ring arranged to travel in the annular channel, a steam-pipe leading into the channel, and an exhaust-pipe leading therefrom, 70
 a suitably-cased bucket-wheel in the path of the exhaust-pipe, a cream-pan on the bowl, provided with a discharge-pipe, a pan in the path of the discharge-pipe, and gearings between the pan and the bucket-wheel. 75

In testimony whereof I affix my signature in presence of two witnesses.

THOS. WILLING.

Witnesses:

H. M. THATCHER,
 ARTHUR D. YOUNG.